

What Is Claimed Is:

1. A method for operating an internal combustion engine (1), in particular of a motor vehicle, including a control unit (2) to control/regulate the internal combustion engine (1) as a function of an air-mass sensor signal (L<sub>1</sub>) from a first air-mass sensor (HFM<sub>1</sub>), wherein at least one first auxiliary signal (H<sub>1</sub>) is utilized, and the influence of an interference variable (S<sub>X</sub>), which affects the air-mass sensor signal (L<sub>1</sub>), on the regulation of the internal combustion engine (1) is reduced as a function of the first auxiliary signal.

2. The method as recited in Claim 1, wherein a comparison (200) of the first auxiliary signal (H<sub>1</sub>), or a signal derived from the first auxiliary signal (H<sub>1</sub>), with the air-mass sensor signal (L<sub>1</sub>), or a signal derived from the air-mass sensor signal (L<sub>1</sub>), is performed and a comparison result (VE) is obtained.

3. The method as recited in Claim 2, wherein, as a function of the comparison result (VE), a controlled variable (R) is obtained for the control of the internal combustion engine (1).

4. The method as recited in Claim 3, wherein the first auxiliary signal (H<sub>1</sub>) is obtained from state variables of the internal combustion engine (1).

5. The method as recited in one of Claims 1 through 3, wherein the first auxiliary signal (H<sub>1</sub>) is obtained from a signal from an exhaust-gas probe.

6. The method as recited in one of Claims 1 through 3, wherein the first auxiliary signal (H<sub>1</sub>) is obtained from a signal from a second air-mass sensor (HFM<sub>2</sub>).

7. The method as recited in one of Claims 1 through 3, wherein the first auxiliary signal (H<sub>1</sub>) is obtained from a signal from an already present rain sensor of the motor vehicle.

8. The method as recited in one of Claims 1 through 3, wherein the first auxiliary signal (H<sub>1</sub>) is obtained from a signal of an additional sensor, the additional sensor being selected from the following group: ultrasound sensor, hot-wire air-mass sensor.

9. The method as recited in one of Claims 1 through 3, wherein the first auxiliary signal (H<sub>1</sub>) is obtained from a signal of a capacitive sensor, the capacitive sensor being configured as integral component of the first air-mass sensor (HFM<sub>1</sub>).

10. The method as recited in Claim 9, wherein the capacitive sensor is configured as plate capacitor having a first and a second capacitor plate, the first capacitor plate being formed by a surface of the first air-mass sensor (HFM<sub>1</sub>).

11. The method as recited in one of Claims 1 through 3, wherein the first auxiliary signal (H<sub>1</sub>) is obtained from a signal from an ohmic sensor, the ohmic sensor being formed as integral component of the first air-mass sensor (HFM<sub>1</sub>).

12. The method as recited in Claim 11, wherein the ohmic sensor includes at least two electrodes preferably made of a corrosion-resistant material.

13. The method as recited in Claim 11 or 12, wherein the ohmic sensor is arranged on a surface of the first air-mass sensor (HFM<sub>1</sub>).

14. The method as recited in one of Claims 1 through 3,

wherein the first auxiliary signal (H<sub>1</sub>) is obtained from the signal of the capacitive sensor as recited in one of Claims 9 or 10 and from the signal of the ohmic sensor as recited in one of Claims 11 through 13.

15. The method as recited in Claim 4 or 5, wherein the comparison (200) includes the following steps: differentiating (210) the air-mass sensor signal (L<sub>1</sub>) to obtain a differentiated air-mass sensor signal (L<sub>1\_1</sub>); differentiating (211) the first auxiliary signal (H<sub>1</sub>) to obtain a differentiated auxiliary signal (H<sub>1\_1</sub>); and forming the difference (220) from the differentiated air-mass sensor signal (L<sub>1\_1</sub>) and the differentiated auxiliary signal (H<sub>1\_1</sub>) to obtain a differential signal (D<sub>1\_1</sub>).

16. The method as recited in Claim 15, characterized by the following steps: scaling (210a) of the differentiated air-mass sensor signal (L<sub>1\_1</sub>) to a time average (L<sub>1\_m</sub>) of the air-mass sensor signal (L<sub>1</sub>), and scaling (211a) of the differentiated auxiliary signal (H<sub>1\_1</sub>) to a time average (H<sub>1\_m</sub>) of the first auxiliary signal (H<sub>1</sub>).

17. The method as recited in Claim 15 or 16, characterized by the following step: forming (230) the amount of the differential signal (D<sub>1\_1</sub>) to obtain a positive differential signal (D<sub>1\_1'</sub>).

18. The method as recited in one of Claims 15 through 17, characterized by the following steps: filtering (240) of the differential signal (D<sub>1\_1</sub>) / the positive differential signal (D<sub>1\_1'</sub>) to obtain a filtered differential signal (D<sub>1\_1\*</sub>).

19. The method as recited in one of Claims 15 through 18, characterized by the following step: comparing (250) the differential signal (D<sub>1\_1</sub>) / the filtered differential signal (D<sub>1\_1\*</sub>) / the positive differential signal (D<sub>1\_1'</sub>) with at least one predefinable threshold value (S<sub>1</sub>).

20. The method as recited in Claim 19, wherein the first auxiliary signal (H<sub>1</sub>) is obtained as controlled variable (R) if the comparison result (VE) indicates that the differential signal (D<sub>1\_1</sub>) / the filtered differential signal (D<sub>1\_1</sub>\*) is greater / smaller than the first threshold value (S<sub>1</sub>) / a second threshold value (S<sub>2</sub>); and the air-mass sensor signal (L<sub>1</sub>) is obtained as controlled variable (R) if the comparison result (VE) indicates that the differential signal (D<sub>1\_1</sub>) / the filtered differential signal (D<sub>1\_1</sub>\*) is smaller than or equal to / greater than or equal to the first threshold value (S<sub>1</sub>) / the second threshold value (S<sub>2</sub>).

21. The method as recited in Claim 19, wherein the first auxiliary signal (H<sub>1</sub>) is obtained as controlled variable (R) if the comparison result (VE) indicates that the positive differential signal (D<sub>1\_1</sub>') / the filtered differential signal (D<sub>1\_1</sub>\*) is greater than the first threshold value (S<sub>1</sub>), and the air-mass sensor signal (L<sub>1</sub>) is obtained as controlled variable (R) if the comparison result (VE) indicates that the positive differential signal (D<sub>1\_1</sub>') / the filtered differential signal (D<sub>1\_1</sub>\*) is smaller than or equal to the first threshold value (S<sub>1</sub>).

22. The method as recited in Claim 4, wherein the comparison (200) includes the following steps: forming the difference (380) from the first auxiliary signal (H<sub>1</sub>) and the air-mass sensor signal (L<sub>1</sub>) to obtain the controlled variable (R).

23. The method as recited in Claim 22, characterized by the following step: filtering (340) of the air-mass sensor signal (L<sub>1</sub>) prior to forming the difference (380) to obtain a filtered air-mass sensor signal (L<sub>1</sub>\*).

24. The method as recited in Claim 23, wherein a low-pass filter (340a) is used for the filtering

(340).

25. The method as recited in Claim 24, wherein the cut-off frequency of the low-pass filter (340a) is selected dynamically and as a function of state variables of the internal combustion engine (1).

26. The method as recited in Claim 25, wherein the cut-off frequency of the low-pass filter (340a) is selected as a function of a model of the internal combustion engine.

27. The method as recited in Claim 1, wherein the first auxiliary signal (H<sub>1</sub>) is obtained by filtering (440) with a high-pass filter (440a) from the air-mass sensor signal (L<sub>1</sub>) and is used as a controlled variable (R) to control the internal combustion engine (1).

28. The method as recited in Claim 27, wherein the cut-off frequency of the high-pass filter (440a) is selected dynamically.

29. The method as recited in Claim 28, wherein the cut-off frequency of the high pass filter (440a) is selected as a function of state variables of the internal combustion engine (1).

30. The method as recited in one of Claims 27 through 29, wherein a second auxiliary signal (H<sub>2</sub>) is obtained by filtering (442) with a low pass filter (442a) from the air-mass sensor signal (L<sub>1</sub>), and the controlled variable (R) is obtained from the first auxiliary signal (H<sub>1</sub>), the second auxiliary signal (H<sub>2</sub>) and state variables of the internal combustion engine (1).

31. The method as recited in Claim 30, wherein the cut-off frequency of the low pass filter (442a)

is selected dynamically.

32. The method as recited in Claim 31, wherein the cut-off frequency of the low pass filter (442a) is selected as a function of state variables of the internal combustion engine (1).

33. The method as recited in Claim 29 or 32, wherein the cut-off frequency of the high pass filter (440a) / low pass filter (442a) is selected as a function of a model of the internal combustion engine (1).

34. The method as recited in Claim 6, wherein both air-mass sensors (HFM\_1, HFM\_2) are arranged in an intake manifold (4) of the internal combustion engine (1) in such a way that air flowing into the intake manifold (4) first reaches the first air-mass sensor (HFM\_1) and then the second air-mass sensor (HFM\_2), which is arranged with a clearance (D) in the flow direction of the aspirated air, and the comparison (200) includes the following steps: delaying (510) the air-mass sensor signal (L\_1) by a delay time ( $\Delta T$ ) to obtain a delayed air-mass sensor signal ( $L_1_{\Delta T}$ ); subtracting (520) the first auxiliary signal (H\_1) from the delayed air-mass sensor signal ( $L_1_{\Delta T}$ ) to obtain a differential signal ( $D_{L_H}$ ); integrating (530) the differential signal ( $D_{L_H}$ ) to obtain an indicator signal ( $A_{L_H}$ ); differentiating (540) the delayed air-mass sensor signal ( $L_1_{\Delta T}$ ) to obtain a differentiated air-mass sensor signal ( $L_1_{\Delta T_1}$ ); forming (541) the amount of the differentiated air-mass sensor signal ( $L_1_{\Delta T_1}$ ) to obtain a positive air-mass sensor signal ( $L_1_{\Delta T_1}'$ ); differentiating (542) the first auxiliary signal (H\_1) to obtain a differentiated auxiliary signal ( $H1_1$ ); forming (543) the amount of the differentiated auxiliary signal ( $H1_1$ ) to obtain a positive auxiliary signal ( $H1_1'$ ); subtracting (560) the positive auxiliary signal ( $H1_1'$ ) from the positive air-mass sensor signal ( $L_1_{\Delta T_1}'$ ) to obtain a further

differential signal (Z\_Diff).

35. The method as recited in Claim 34, characterized by the following steps: Comparing (570) the indicator signal (A\_L\_H) with at least one threshold value if the indicator signal (A\_L\_H) exceeds a threshold value: obtaining (580) the controlled variable (R) from the first auxiliary signal (H\_1) and the indicator signal (A\_L\_H) if the differential signal (Z\_Diff) is positive; obtaining (581) the controlled variable (R) from the air-mass sensor signal (L\_1) and the indicator signal (A\_L\_H) if the differential signal (Z\_Diff) is negative.

36. The method as recited in Claim 34 or 35, wherein both air-mass sensors (HFM\_1, HFM\_2) are arranged side-by-side; the delay step (510) is omitted; and the second air-mass sensor (HFM\_2) is provided with a water-droplet separator.

37. The method as recited in Claim 36, wherein a model simulating the dynamic response of the water-droplet separator is taken into account in the processing of the air-mass sensor signal (L\_1) and/or the first auxiliary signal (H\_1).

38. The method as recited in one of Claims 34 through 37, wherein both air-mass sensors (HFM\_1, HFM\_2) are integrated in a shared sensor system, preferably in a shared housing.

39. The method as recited in one of Claims 7 through 14, characterized by the following steps: Deriving the interference variable (S\_X) from the first auxiliary signal (H\_1); obtaining the controlled variable (R) as a function of the interference variable (S\_X).

40. The method as recited in one of the preceding claims,

wherein the first air-mass sensor (HFM\_1) is configured as hot-film air-mass sensor.

41. A computer program for a control unit of an internal combustion engine of a motor vehicle, in particular, having a program code which is suitable for executing the method as recited in one of Claims 1 through 40 when it is run on a computer.

42. The computer program as recited in Claim 41, the program being stored on a computer-readable data carrier.

43. An internal combustion engine (1), in particular for a motor vehicle, having a control unit (2) for controlling/regulating the internal combustion engine (1) as a function of an air-mass sensor signal (L\_1) from a first air-mass sensor (HFM\_1), wherein at least one first auxiliary signal (H\_1) is provided to reduce the influence of an interference variable (S\_X), which affects the air-mass sensor signal (L\_1), on the regulation of the internal combustion engine (1).

44. A control unit (2) for an internal combustion engine (1), in particular of a motor vehicle, for the control/regulation of the internal combustion engine (1) as a function of an air-mass sensor signal (L\_1) from a first air-mass sensor (HFM\_1), wherein at least one first auxiliary signal (H\_1) is provided to reduce the influence of an interference variable (S\_X), which affects the air-mass sensor signal (L\_1), on the regulation of the internal combustion engine (1).